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Alliance for Telecommunications Industry Solutions

Problem Solvers to the Telecommunications Industry

October 15, 2002

VIA HAND DELIVERY

Marlene H. Dortch, Secretary
Office of the Secretary
Federal Communications Commission
445 12th Street, SW, Room TW-A325
Washington, DC 20554

Re: TTY Forum's Aggregate Report of Carriers for 3rd Quarter 2002, CC Docket No. 94-102

Dear Ms. Dortch:

Enclosed are an original and four copies of the TTY Forum 23 Meeting Summary. Appendix L contains an aggregate report of wireless service providers, handset and infrastructure manufacturers for 3rd Quarter 2002 filed on behalf of ATIS' sponsored TTY Forum and in response to the Commission's Fourth Report and Order in the above-captioned case. Please date-stamp and return the enclosed extra copy of this filing to our messenger.

Please contact me at 202/434-8830 if you have any questions or comments.

Sincerely,

Toni E. Haddix
Staff Attorney

Enclosures

cc: Barry Ohlson, Chief, Policy Division, WTB
Pamela Gregory, Director, Disabilities Rights Office, CGB
Mindy Littell, Attorney Advisor, Policy Division, WTB

TTY Forum – 23
Meeting Summary Report

October 8, 2002
ATIS Conference Center
Washington, DC

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TTY/TDD Forum – 23

October 8, 2002
ATIS Conference Center
1200 G Street, NW, Suite 500
Washington, DC

Agenda

Chaired by Ed Hall, ATIS

1. Call to Order, Introductions and Attendance Roster

2. Call for and Numbering of Contributions
   (All Contributions will be numbered as follows: TTY23/02.10.08.XX)

3. Review & Approve Agenda

4. TTY Forum #22 Summary

5. TTY Correspondence and Liaison Reports: *FCC; CTIA; NAD; TDI; NENA; ATIS; other*

6. Review TTY Forum #22 Agreements and Action Items

7. Industry Implementation Status & Consumer Reports
   Please note that the Forum is particularly interested in hearing about the rollout of TTY service over digital wireless networks. What has worked well? Have there been implementation problems that need to be addressed by the Forum?

8. Technical Activities
a. TTSI Report
b. IVR Forum Correspondence regarding VoIP

9. GemPad: A Full Text Small Form Factor Keypad (Ravi Krishnan, GemPad, Inc.)

10. Open Floor Discussion
    The chair will lead a discussion regarding next steps for the TTY Forum. Some issues to be considered include:
    - Deployment of TTY Roll Out
    - TTY Call Completion to PSAPs
    - PSAP and Vendor TTY Testing
    - Active/Dormant State of TTY Forum
    - Other

11. Next Meeting

12. Adjournment

Meeting Summary

1. **Call to Order, Introductions and Attendance Roster**
   Ed Hall, ATIS, Chair, called the meeting to order at 9:10 a.m. He thanked all the participants in attendance for their participation. All participants took the opportunity to introduce themselves.

2. **Call for and Numbering of Contributions**
   (All Contributions will be numbered as follows: TTY23/02.10.08.XX)
   Mr. Hall introduced all contributions, and asked for any additional contributions. All contributions provided to the Secretariat electronically are available for download on the TTY Forum web site at http://www.atis.org/atis/tty/documents, or by sending a request to Megan Hayes (mhayes@atis.org). Contributions were submitted and numbered as follows:

Number	Title
TTY23/02.10.08.01	Agenda
TTY23/02.10.08.02	Roster
TTY23/02.10.08.03	TTY 22 Meeting Summary
TTY23/02.10.08.04	TTY 22 Agreements and Action Items
TTY23/02.10.08.05	TTSI Report to TTY Forum #23
TTY23/02.10.08.06	IVR Forum Liaison Letter re: TTY and VoIP
TTY23/02.10.08.07	TTY Forum #23 Report from Cingular Wireless
TTY23/02.10.08.08	Report from Gallaudet University on Usability Tests and Issues
TTY23/02.10.08.09	Proposed Modifications to Annex A of ITU-T Recommendation V.18
TTY23/02.10.08.10	ITU – Proposed New Work Item on Text over IP
TTY23/02.10.08.11a	Nortel Networks Report for TDMA
TTY23/02.10.08.11b	Nortel Networks Report for CDMA
TTY23/02.10.08.12	Report from Gallaudet University on Shopping for TTY over Wireless
TTY23/02.10.08.13	Cingular Wireless TTY Quick Reference Card
TTY23/02.10.08.14	TDI Report to TTY Forum #23
TTY23/02.10.08.15	GemPad Presentation
TTY23/02.10.08.16	Ericsson Status Report Presentation

3. **Review & Approve Agenda**
   The agenda (Contribution TTY23/02.10.08.01) was distributed and one change was made moving the GemPad Presentation to before the Industry Implementation and Consumer Organizations' Status Reports. The agenda was approved as modified.

4. TTY Forum #22 Summary

Mr. Hall introduced Contribution TTY23/02.10.08.03, the Meeting Summary from TTY Forum #22 and asked if there were any suggested modifications. There were none, and the Meeting Summary was approved as submitted.

5. TTY Correspondence and Liaison Reports

Federal Communications Commission (FCC)

Mindy Littell, FCC, introduced all FCC participants and noted that the Commission is interested in hearing an update on the status of the rollout of TTY service over the digital wireless network. There were several waivers granted on June 28, 2002, and the Commission is expecting those companies that received waivers to work to implement their solutions before the deadline given. It appears that TTY compatibility is being provided in many areas nationwide and the Commission acknowledges the significant amount of work needed for such a task. Ms. Littell noted that it could not have been accomplished without the efforts of the TTY Forum and she thanked the Forum and its participants for their hard work and dedication. After an inquiry, Janet Sievert, FCC, noted that the Disability Rights Office has been working to make contact with the Department of Justice (DoJ), but they are not prepared to report on it at this time.

Telecommunications for the Deaf, Incorporated (TDI)

No report given at this Forum.

National Emergency Number Association (NENA)

There were no attendees from NENA at this meeting.

Alliance for Telecommunications Industry Solutions (ATIS)

Mr. Hall reported that ATIS staff had visited the Department of Justice to discuss the PSAP issue, and ATIS and the DoJ are attempting to develop a method by which to deal with TTY calls via digital wireless in the PSAPs. Mr. Hall also noted that ATIS' Committee T1 hosted a Voice over Internet Protocol (VoIP) Summit in August, and the issue of TTY on VoIP was addressed. The VoIP Summit identified five crucial areas for VoIP, one being TTY compatibility. Mr. Hall also noted that the ATIS' Emergency Services Interconnection Forum (ESIF) is currently addressing the issue of a callback number for non-initialized phones.

Cellular Telecommunications & Internet Association (CTIA)

Andrea Williams, CTIA, reported that CTIA has two issues that it wishes to have addressed at TTY Forum #23. First, CTIA would like to know the status of NENA participation in the TTY Forum, especially in light of the need for their help in solving the PSAP issue. The wireless industry has concerns that they have spent time and resources over the past 5 years to provide TTY users with access to emergency services via the digital wireless infrastructures while the emergency services community has not played an active role in the process. Second, CTIA would like to hear the consumer organizations' plans to aid in the education of consumers on the use of TTY over digital wireless. CTIA offered their assistance in the educational effort.

6. Review TTY Forum #22 Agreements and Action Items

Mr. Hall reviewed the action items from TTY Forum #23, and noted that all action items have been completed.

7. Industry Implementation Status & Consumer Reports

Ericsson

Stephen Hayes, Ericsson, presented Contribution TTY23/02.10.08.16, the Ericsson Status Report. He noted that the TDMA and GSM networks have been rolled out by all major carriers, and that the CDMA network has been rolled out by Leap Wireless and Qwest in Omaha. Ericsson is waiting for further deployment by Qwest in other markets.

Sony Ericsson

Matt Kaltenbach, Sony Ericsson, reported that they have completed their verification of the algorithms in all technologies and that the handsets perform to the requirements. They have completed interoperability testing with all wireless technologies. During the summer, they conducted beta testing and user trials in various markets across the country by working with SHHH and NAD. They anticipate further education and marketing to allow for successful user experiences.

AT&T Wireless Services (AWS)

Lori Beurger, AWS, reported that they are in complete compliance with the FCC digital wireless compatibility regulations. Work was completed on the one portion of the network that required a waiver by the end of August 2002. AWS is continuing sales force training and consumer education. Their boxes are being labeled with the TTY symbol and product sheets are being printed for points of sale. In addition, TTY will be identified as a feature on phones. They are creating a list of TTY compatible phones for consumers and salespeople. All information will be available on their web site.

T-Mobile USA

Harold Salters, T-Mobile USA, reported that by June 30, 2002, T-Mobile had rolled out digital wireless functionality with the exception of some markets in Pennsylvania. In early September, the TTY functionality was enabled and working in those markets. There is one handset on their network that works with one TTY model. They are, however, looking at the range of solutions for handsets and TTY models for going forward.

Sprint PCS

Scott Freiermuth, Sprint PCS, reported that they are fully compliant with the FCC digital compatibility regulations. They continue to participate in TTSI testing. They have 16 handsets that are TTY capable, and they are continuing to look for additional products to be compatible. They are also continuing to institute in-store training and consumer education.

Nokia

Chris Wallace, Nokia, reported that they have 11 phone models that are TTY Compatible (5 GSM, 5 TDMA, and 1 CDMA). They cover the range of the line, from the high end to the

economy phones. In terms of requirements definition of new models, TTY compatibility is part of the process, so new phones should also be TTY compatible.

Cingular Wireless

Ken Evans, Cingular Wireless, reported that they are three months into deployment. They are fully compliant with all TDMA and GSM markets. Cingular Wireless is in the process of overlaying TDMA with GSM and is requiring testing of every switch for TTY capability. Copies of the Quick Tips on TTY compatibility, which were sent to the sales force, are available as Contribution TTY23/02.10.08.13, although the one provided is not the most recent release of the document. Mr. Evans noted that labeling continues to be an issue and Cingular Wireless is working to resolve it. On an ongoing basis, Cingular Wireless continues to have concern regarding the PSAP problem. He noted that ATIS has done an exemplary job of inviting the emergency services community to testing events and other activities, but that they still have not participated. Cingular Wireless is looking forward to finding a process to resolve the PSAP problem.

QUARTERLY REPORTS

Mr. Hall asked the FCC if implementation status reports would be due from the industry for this quarter. Ms. Littell responded that status reports are due only for those carriers that have received waivers from the Commission. The FCC provided the following statement for the TTY Forum:

> Quarterly reports to the FCC are required from carriers through full implementation. If a carrier believes that they have completed implementation, they can file a final report indicating that they have completed implementation, or they can file their name with ATIS for inclusion in the TTY Forum list of carriers that are compliant. Once this has been completed, a carrier can cease filing quarterly reports with the FCC. If a carrier has received a waiver, they should continue to report each quarter until they have fully implemented TTY functionality and are in compliance with the relevant regulations regarding TTY over digital wireless technologies. Parties are always welcome to file submissions with the FCC regardless of their implementation status.
>
> All entities wishing to file a submission with the FCC should file their document with the Secretary's office and reference CC Docket No. 94-102.

Megan Hayes, TTY Forum Secretariat, informed participants that reports would be due on **October 11, 2002 by 12noon Eastern Time**. She apologized for the short notice. Ms. Hayes also explained that the list of companies that had reported themselves compliant would be added to Appendix L, the Implementation Status Reports.

ACTION ITEM: Carriers who believe that they have completed implementation should send an email to Megan Hayes (mhayes@atis.org), indicating their compliance. That carrier's name will be added to the list being compiled for inclusion in the TTY Forum Meeting Summary Appendix L: Industry Implementation Status Reports.

TDI

Jim House, TDI, presented Contribution TTY23/02.10.08.14 and noted that the report is in response to an ATIS request for information from the consumer base. TDI sent out an electronic survey to their membership and this report is a result of that survey. Mr. House suggested that the industry advertise in deaf publications to help make TTY users aware that service is available on digital wireless networks.

Gallaudet University

Judy Harkins presented Contributions TTY23/02.10.08.08a & TTY23/02.10.08.12a (these contributions are PowerPoint presentations that correspond with reports that are referenced below). Contribution .08 is a report on the Usability Tests that Gallaudet University conducted in the spring with Cingular Wireless and Sony Ericsson. Ms. Harkins thanked the companies involved for their help in the testing and the seriousness with which they took the consumer problems. She also thanked the TTY Technical Standards Implementation (TTSI) Incubator for their work in addressing problems from the consumer community.

Contribution .12 is a report on shopping trips that several Gallaudet University staff members performed to determine if the sales people were aware of the TTY functionality and if they would be able to help TTY users identify which phones were compatible.

Cary Barbin presented Contribution TTY23/02.10.08.17, a presentation regarding the evolution of TTY. Mr. Hall noted that he had requested such a presentation from Gallaudet University because of the importance of the industry being aware of future accessibility needs.

8. Technical Activities

a. TTSI Report

Jim Turner, ATIS, presented Contribution TTY23/02.10.08.05, the TTSI Report to TTY Forum #23. There was a discussion of the PSAP issue and whether it was the responsibility of the wireless carrier or the responsibility of the PSAP to ensure that the call is completed. The forum determined that the carriers' responsibility ends once information is delivered to the PSAP. Once information is delivered, it is the PSAP's responsibility to complete the call. The telecommunications industry noted that they understand the importance of ensuring that all calls are completed to PSAPs and noted their willingness to work with PSAPs, PSAP manufacturers and the emergency services community to ensure that the technical problems that remain can be resolved and TTY users over the digital wireless networks can complete calls to PSAPs when there is an emergency. Several participants expressed their concern that the TTSI is assuming that problems exist in the PSAP without having tested using land line services to see if they experience similar problems.

AGREEMENT REACHED: TTSI should verify that the PSAP problem is not limited to wireless service before making the assumption that the problems exist in the PSAP.

b. IVR Forum Correspondence regarding VoIP

Ken Evans, IVR Forum Co-Chair, reported that the IVR Accessibility Forum had sent a liaison letter to the TTY Forum with information about a potential problem with transmitting TTY baudot tones over Voice over Internet Protocol (VoIP). He explained that the letter was for informational purposes and that there are several standards groups at work on developing a solution to the problem.

9. Industry Presentations

a. GemPad: A Full Text Small Form Factor Keypad

Ravi Krishnan, Chairman & CEO of GemPad, Inc., presented Contribution TTY23/02.10.08.15. GemPad is a full text small form factor keypad. For more information, please contact Mr. Krishnan (ravi_c_krishnan@hotmail.com) or visit http://www.gempad.com.

b. Krown Manufacturing Presentation

Bryan Davis, Krown Manufacturing, made a presentation regarding their new product, the Pocketcomm, which is a small TTY device. For more information, please contact Mr. Davis at computty@aol.com or visit http://www.krowntty.com.

10. Open Floor Discussion

Mr. Hall led a discussion regarding next steps for the TTY Forum. During the discussion the point of demarcation between where the wireless industry responsibility for an emergency call ends and where the PSAP responsibility for a call begins was addressed. In addition, there was discussion of attempting to get the Department of Justice to aid in solving the PSAP problem.

ACTION ITEM: TTSI, ATIS, TDI, NAD, along with NENA, NASNA and APCO, will develop and present a business plan to the Department of Justice. The plan will include the development of an education piece for PSAP call takers and a self-verification test for PSAP equipment. Before the business plan is presented, the TTY Forum should send a correspondence to the DoJ, copy to the FCC, which indicates accomplishments of the wireless industry, a list of problems discovered and resolved, TTSI test results, and a recommended resolution for remaining problems.

Participants expressed interest in the results of the surveys conducted by TDI and Gallaudet University and wanted to know if there could be a central place to access consumer feedback. Judy Harkins offered to coordinate the collection of such information and forward it to the TTY Forum for its use.

ACTION ITEM: Gallaudet University will collect information on consumer feedback on digital wireless TTY service. The TTY Forum will develop a web site for posting this information. The information on this site will not be carrier specific.

During the discussion of the next steps for the TTY Forum, many suggestions were made, including allowing the Forum to go into dormancy stage, disbanding the Forum, having the Forum meet every six months, and calling meetings only when necessary. The Forum

decided to plan for another meeting in 6 months, but to leave it to the discretion of the Chair as to whether one is needed or not.

AGREEMENT REACHED: The TTY Forum should plan to meet in 6 months to determine if the Forum's work is complete. One month before the next meeting, the Chair will call for contributions and publish a draft agenda. Should there be insufficient contributions, the Chair should make a determination of need for a meeting. Should a meeting not be necessary in 6 months, the TTY Forum should be moved into a dormant state and could then be reactivated if necessary. The web site and list serve would remain open for the collection and dissemination of information.

11. Adjournment

Mr. Hall adjourned the meeting at 4:20pm ET.

TTY – 23
Meeting Roster
October 8, 2002
Washington, DC

Name	Company	Telephone	Fax	Email
Catrina Akers	ATIS	202-628-6380	202-393-5453	cakers@atis.org
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Andrea Williams	CTIA	202-736-3215	202-785-8203	awilliams@ctia.org

APPENDIX A
Agreements and Action Items

AGREEMENTS REACHED AND ACTION ITEMS FROM TTY FORUM - 23

23.1 Carriers who believe that they have completed implementation should send an email to Megan Hayes (mhayes@atis.org), indicating their compliance. That carrier's name will be added to the list being compiled for inclusion in the TTY Forum Meeting Summary Appendix L: Industry Implementation Status Reports.

23.2 TTSI should verify that the PSAP problem is not limited to wireless service before making the assumption that the problems exist in the PSAP.

23.3 TTSI, ATIS, TDI, NAD along with NENA, NASNA and APCO will develop and present a business plan to the Department of Justice. The plan will include the development of an education piece for PSAP call takers and a self-verification test for PSAP equipment. Before the business plan is presented, the TTY Forum should send a correspondence to the DoJ, copy to the FCC, which indicates accomplishments of the wireless industry, a list of problems discovered and resolved, TTSI test results, and a recommended resolution for remaining problems.

23.4 Gallaudet University will collect information on consumer feedback on digital wireless TTY service. The TTY Forum will develop a web site for posting this information. The information on this site will not be carrier specific.

23.5 The TTY Forum should plan to meet in 6 months to determine if the Forum's work is complete. One month before the next meeting, the Chair will call for contributions and publish a draft agenda. Should there be insufficient contributions, the chair should make a determination of need for a meeting. Should a meeting not be necessary in 6 months, the TTY Forum should be moved into a dormant state and could then be reactivated if necessary. The web site and list serve would remain open for the collection and dissemination of information.

AGREEMENTS REACHED AND ACTION ITEMS FROM TTY FORUM - 22

22.1 Dick Brandt will edit Contribution TTY22/02.06.04.06 and send it to Megan Hayes for contribution to TR30.1

22.2 Contribution TTY22/02.06.04.06 will be sent, as edited by Dick Brandt, to TR30.1.

22.3 The TTY Forum will send a consensus statement to the FCC that reflects the readiness of the industry for TTY deployment over the digital wireless network by the June 30, 2002 deadline.

22.4 The Secretariat will draft a consensus statement for the FCC and distribute it to the members of the TTY Forum by June 18, 2002 for their consideration. The participants will submit their comments by June 25, 2002, and the Secretariat will forward the final document to the FCC.

AGREEMENTS REACHED AND ACTION ITEMS FROM TTY FORUM - 21

21.1 Megan Hayes will compare the contribution from Gunnar Hellstrom regarding 3GPP standards and compare it to Appendix J. She will also compare the list from Dick Brandt, Gallaudet University. The complete list will be included with the Meeting Summary for TTY Forum #21.
21.2 Ed Hall, ATIS, will inform the TTY Forum of the outcome of the meeting with the FCC and will distribute the power point presentation made at the FCC.
21.3 The telecommunications industry should use a consistent symbol to indicate that a handset will work with a TTY. Specifically, the internationally recognized TTY symbol or some modification of it should be used.

AGREEMENTS REACHED AND ACTION ITEMS FROM TTY FORUM - 20

20.1 Line Item #13 in the User Intervention Document regarding the usability of a device in an "eyes-busy" environment will be removed.
20.2 Line Item #7 in the User Intervention Document will be changed to the following wording: "Does the TTY mode setting interfere with the operation of other features of the handset system?" (e.g., does connecting the cable or enabling the TTY mode disable the vibrate feature or the direct dialing capability?)
20.3 SHHH and Gallaudet University will assist the TTSI Incubator in VCO/HCO testing and consumer trials. The TTSI Incubator will determine how to move forward with VCO/HCO testing and consumer testing in the Washington, DC area.
20.4 Verizon Wireless will find the standard that addresses the physical requirements of the 2.5 mm jack and provide the information to the TTY Forum for inclusion in Appendix J. This information will also be provided to TR45.1.
20.5 The Terminal Product Labeling group will be closed.
20.6 The Terminal Product Identification Committee Working Group of the TTY Forum will be formed to work the labeling issue and bring a recommendation back to the TTY Forum Plenary. The group will be Chaired by Jim House, and include as members: Beth Wilson, Susan Palmer, Al Lucas, Matt Kaltenbach, David Nelson, Ron Schultz, Chris Wallace, Peter Lee, Linda Day, Lee Whritenour and Scott Freiermuth.
20.7 TTY Forum – 21 will be held March 5, 2002 at the ATIS Conference Center in Washington, DC.
20.8 TTY Forum – 22 will be held June 4, 2001 at the ATIS Conference Center in Washington, DC.
20.9 The topic of Roll-Out Guidelines and Considerations will be turned over to the TPI Working Group for exploration. The resulting suggestions will be included as an appendix in the next meeting summary.
20.10 Ed Hall will extract information regarding non-initialized phones and 911 calls from previous meeting notes.
20.11 The Manufacturers will provide information to the TTY Forum regarding the behavior of 911 TTY calls in a non-activated SIM terminal.

AGREEMENTS REACHED AND ACTION ITEMS FROM TTY FORUM – 19

19.1 The TTY Forum Chair will communicate to the TTSI Incubator Group that there should be a white paper written identifying the problem with SMS messaging tones with TTY. The white paper should also address any other features that use auditory alerts and may cause higher character error rates.
19.2 The TTSI Incubator Group should plan to include testing during high-traffic hours.
19.3 TTY Forum participants agreed to use Gallaudet University's testing script version 1 (1.1) for all FOA type testing, and to continue to use Lober and Walsh for all lab testing.
19.4 The consumer community will review line item #13 in the TTY User Intervention Document (Appendix E) regarding "Is it usable in an "eyes busy" environment" and re-state it, if needed, to clarify confusion.
19.5 Line Item #7 of the TTY User Intervention Document (Appendix E) will be reviewed and edited off-line by Gallaudet to cover the interference of TTY with other phone features, including dialing.
19.6 The Voice Mail Recommendations will be passed on to the IVR Forum for their review, via a liaison from the TTY Forum.
19.7 The revised Appendix E of the TTY Forum Meeting Summary was approved as revised.
19.8 There will be a TTY Forum Working Group to address drafting guidelines for the industry on labeling equipment to indicate that it is TTY Compatible (members will include: Beth Wilson, Chair, Al Lucas, Matt Kaltenbach, Chris Wallace, Ken Evans, Jim House, David Nelson, Linda Day, Ron Schultz and Al Sonnenstrahl).

AGREEMENTS REACHED AND ACTION ITEMS FROM TTY FORUM – 18
18.1 Contribution TTY18/01.06.12.13, "Testing Against User Requirements" will be added to Appendix D: TTY Test Completion Matrix of the TTY Forum Meeting Summary.
18.2 The Secretariat will add contribution TTY18/01.06.12.13, "Testing Against User Requirements" to Appendix D: TTY Test Completion Matrix of the TTY Forum Meeting Summary.
18.3 Judy Harkins will provide the URL for the web site describing the testing tools technology to the TTY Secretariat to make the information more readily available to TTY Forum participants.
18.4 The list of questions regarding user intervention (Contribution TTY18/01.16.12.15), will be considered for further discussion of user intervention.
18.5 The product labeling issue will be deferred until the next TTY meeting due to time constraints.
18.6 Regarding Features and Functions:
CALL WAITING (CW)
CW interferes with TTY communications.
CW as a feature is disruptive and often not used by TTY users. Disabling CW by default for phones in TTY mode is an acceptable solution to the consumer community.
CW can be disabled in a GSM environment (either permanently or via the handset menu).
CW cannot be disabled via the handset menu in a TDMA environment; it has to be disabled at the switch.
VOICEMAIL/TTY MAIL (VM)
Some systems do not record and play back to TTY machines as well as others.
VM should be placed on the next TTY Forum agenda and referred to the AVSS/IVR Forum.
SHORT MESSAGING SERVICE (SMS)

SMS signals may cause interruption in TTY communications.
SMS is a desired feature for the consumer community.
Queuing of SMS messages during a TTY conversation is not supported in some networks.
18.7 Elizabeth Lyle will submit a written proposal for a consolidated report for submission to the FCC. This report will be posted to the TTY Forum web site.
18.8 The next meeting of the TTY Forum (#19) will be held September 26 at the ATIS Conference Center in Washington, DC.
18.9 TTY Forum #20 will be held December 11 at the ATIS Conference Center in Washington, DC.

AGREEMENTS REACHED AND ACTION ITEMS FROM TTY FORUM - 17

17.1 The TTY Forum recognized ATIS as its Secretariat and official sponsor.
17.2 Ericsson, Lucent, and Nokia will look into the voice quality issue in terms of IS 127-2 CDMA and TDMA and report back to the TTY Forum whether or not there is a problem.
17.3 Consumer groups will review the "user intervention" handset function and report back at the next TTY Forum on whether or not the function is considered a viable option.
17.4 It was agreed to disband the E-Protocol Working Group.
17.5 It was agreed that the TTY Forum would file an ex parte to the FCC to report the solution proposed by the E-Protocol Working Group and the action taken by the TTY Forum.

AGREEMENTS FROM TTY FORUM — 16

16.1 TTY Secretariat, Megan Hayes, will add a non-attending participants list of those who submit implementation status reports to the chair but were unable to attend the TTY Forum
16.2 The industry implementation status reports will be added as an appendix to the meeting summary (Appendix L). All written reports will be sent to the chair within ten working days following the forum. This agreement will be sent out the list serve to ensure that all TTY participants (past and present) are aware of the agreement. The final Meeting Summary will be submitted to the FCC and will become public record.
16.3 TTY Forum industry members find that it is not within the scope and purview to address the e-protocol issue at this time. However, the chair will pass the concept and recommendation to SDO's (e.g. T1P1, TR45)
16.4 A working group will be created to explore the e-protocol issue. There will be an effort to ensure that all industry sectors are represented.

AGREEMENTS FROM TTY FORUM – 15

15.1 Toni Dunne, NENA, will be the principle point of contact for coordinating with PSAPs at a point in carriers, infrastructure, and mobile handset vendors field testing.
15.2 The TTY Forum will hold its next meeting on October 24, 2000 (second choice is October 25, 2000) at Gallaudet University. Meetings thereafter will be held on an "as needed" basis. The summary of the report from the October 2000 meeting will be formally forwarded to the FCC with a cover letter written by the Co-Chairs. Furthermore, on a voluntary effort, carrier will post a status update on their Website and/or the TTY list serve on 3/01, 9/01, and 3/02.

AGREEMENTS FROM TTY FORUM – 14

14.1 Establish Appendix J which will be a "living" document of technical terms and organizations and Appendix J, also a "living" document of technical standards development essential to the TTY Forum's Scope.

AGREEMENTS FROM TTY FORUM – 13

13.1 Lucent announced they will distribute the TTY vocoder solution, royalty-free, to mftrs implementing the solution. Lucent noted that it is not relinquishing the patent rights, just making the solution available royalty-free.

AGREEMENTS FROM TTY FORUM – 9

9.1 The TTY Forum agrees to submit User Requirements to TR45 in December, 1998.
9.2 Appendix G will be created as a living document to identify membership of the TTY Forum Test Procedure Study Group that will meet to track test plan modifications, facilities, and dates, user expert, point of contact.
9.3 Appendix H will be created to identify the operational characteristics of TTY devices.
9.4 The TTY Forum will develop a list of TTYs that fall within the domain of reasonable operational characteristics to provide an informational guide for carriers. The list will be available to the public via web sites and mailings.
9.5 The TTY Forum agrees that IWF is broadly defined as a translation method to complete a call that is transparent to the user. The IWF is not limited to either voice or data. An IWF may not be confined to a single network but may be shared across multiple networks.
9.6 The TTY Forum agrees to submit the SRD for the 2.5 mm Jack to TR45 in December, 1998.
9.7 The TTY Forum agrees to submit the SRD for Circuit Switched Data to TR45 in December, 1998

AGREEMENTS FROM TTY FORUM – 8

8.1 The TTY Forum agrees that all testing will be done in test labs simulating field conditions.
8.2 The TTY Forum agrees that the short-term solution will now be referred to as voice-based solutions. The long-term solution is now referred to as data based solutions.
8.3 An experienced TTY user will be available at the beginning of lab testing to provide counsel or training, if necessary.

AGREEMENTS FROM TTY FORUM – 7

7.1 The TTY Forum should remain operational until solutions are provided and implemented for all digital technologies, to the satisfaction of the TTY Forum.
7.2 The baseline for the digital solution is wireless analog performance.
7.3 Accept Contribution #12 as a working document to represent the basis of the test plan. Test Plan as modified by the technology groups (CDG,UWCC,GSMNA) will be sent to all phone manufacturers. Test plan will measure the performance of various digital air interface technologies.
7.4 Where possible, VCO/HCO should be included in the testing, design, and availability of TTYs, cellular phones, and air interface technologies.
7.5 The TTY Forum will submit a request for a three month extension to the FCC.

AGREEMENTS REACHED AT TTY FORUM - 6

6.1 Any carrier not in compliance with the Consumer Notification Process established at TTY Forum should be brought to the attention of the TTY Forum for resolution.
6.2 Working Group #1 is officially dissolved having completed its initial charter. Any further testing results would be forwarded directly to the TTY Forum.
6.3 A lack of TTY technical standard has resulted in a variance of TTY performance levels manifested when used on digital networks. As such, in developing the "short-term" digital solution, certain least used models of TTY may not be supportable on all digital air interfaces.

AGREEMENTS REACHED AT TTY FORUM - 5

5.1 As an initial step, carriers who can offer TTY users at least one digital phone model for each digital technology that a carrier offers at a reasonable price by October 1, 1998 would be considered in compliance of the E9-1-1/TTY compatibility requirements.
5.2 The FCC can use the information contained in the notification letter in any way they feel would expedite getting the information to the consumer.
5.3 All test results submitted will be included in the next Quarterly Status Report.

AGREEMENTS REACHED AT TTY FORUM - 4

4.1 Objective test (Throughput Test) approved and to be sent to manufacturers and carriers with a matrix to record testing completion dates and documentation.
4.2 TTY Forum Test Completion Matrix approved.
4.3 Consensus reached that Testing Matrix should go to every manufacturer listed at CTIA as well as Wireless and Wireline Carriers. CTIA/PCIA will escalate/elevate TTY Forum efforts to reach wireless equipment manufacturers and inform of urgency and criticality of rapid response to the Testing Matrix via a letter from the TTY Forum and CTIA/PCIA. The group recognizes that participation is voluntary. Copies of letter and matrix responses will be sent to the FCC.
4.4 RFI will be put on issues list to explore possibility of interference between phone and TTY device.
4.5 Consensus to put TTY Forum's current research opinion on output voltages (coupling information) into a formal document and present to manufacturers for feedback. Give 30 days for feedback.
4.6 Subjective test (End User Test) to be finalized by committee. Testing will be handled through Gallaudet with assistance from Wireless manufacturers and TTY manufacturers. Will replicate authentic 9-1-1 calls with a deaf/hearing impaired caller and a trained calltaker.
4.7 CTIA will produce a list of Analog Phones that are compatible with TTY devices to be included in notification efforts and on web sites due as a Contribution at the next TTY Forum.
4.8 Gallaudet University and Consumer groups will draft a Consumer Requirements Document due as a Contribution at the next TTY Forum.
4.9 CTIA/PCIA will send letter to wireless equipment manufacturers requesting that they support Gallaudet University in their testing efforts by sending equipment.
4.10 Standards Requirements Documents (SRD) due for V.18 and the 2.5 mm jack as Contributions at next TTY Forum.

AGREEMENTS REACHED AT TTY FORUM - 3

3.1 6 sponsored spots for identified consumer groups, relinquished if member misses 2 consecutive meetings.
3.2 Accept modified "readability test" to be used by phone manufacturers to benchmark TTY over digital capabilities, to determine success rate for transport. (See Contribution TTY/98.02.11.06) Two tests: Manufacturers Readability Test, End User Test
3.3 Error rate is defined as "character" not "bit" for the purpose of this forum. (Shift error rate of ratio 1/8 (i.e. 1 shift error causes up to eight text errors and will be counted as such) to be determined)
3.4 Develop User Requirements Document. The outcome of Working Group #2. Represents the effort to provide for future advancements in technology by looking at solutions beyond 45.45 baud, Baudot.
3.5 Define process to update Notification Document: refer updated information to CTIA to be distributed to T-CAT.

AGREEMENTS REACHED AT TTY FORUM - 2

2.1 Combine Working Group #1 and Working Group #3. Develop new set of deliverables based on the October 1, 1998 deadline.
Short term solution: solve for backward compatibility.
Develop Standard Test to measure error rate of TTY over digital.

AGREEMENTS REACHED AT TTY FORUM - 1

1.1 "Solve for 45.45 Baudot, not to preclude looking for other solutions."
Look for long term and near term solutions.
Near term - send through vocoder
Long term - circumvent vocoder, enhance quality and connectivity
Provide for the analog function of wireless phones.
The only body that can change the agreements reached is this body. All agreements remain intact until/unless action is taken in this forum.

APPENDIX B

Recommended Text
Consumer Notification

ATTENTION TTY USERS

Background

A TTY (also known as a TDD or Text Telephone) is a telecommunications device that allows people who are deaf, hard of hearing, or have speech or language disabilities to communicate by telephone. A TTY has a keyboard used to type a conversation, which then is transmitted as tones over a wired telephone line. The tones are translated to text that appears on a person's TTY screen.

911 and TTY Access Through Wireless Services

Federal law requires the telecommunications industry to provide a way for TTYs to communicate through wireless systems to make 911 calls. There are two types of wireless phones – analog and digital.

Analog – It is possible today to use some analog wireless phones reliably to call 911 with a TTY.

Digital – It is not possible today to use a digital wireless phone reliably to call 911 with a TTY.

Research is being done to improve the ability of digital phones to work reliably with TTYs. The industry is working to resolve this matter by October 1998.

[Optional: For more information, contact . . .]

DATE OF PUBLICATION:

APPENDIX C

TTY Forum Issue Statements

6.1 The TTY Forum doesn't support one solution over the other but it seems that the 2.5 mm jack is preferred

6.2 It is acceptable in concept to retrofit the TTY at no cost to the user. Concern was expressed regarding warranty work, and who would perform work on equipment. The retrofit should not eliminate or impact any functionality previously available to the user. Time to retrofit should be reasonable. A liaison should be established between manufacturers and user groups to ensure "certain conditions" are met.

6.3 The issue of the false propagation of errors, created by the incorrect receipt of a shift character should be addressed through use of an appropriate test script. The script should contain multiple shifts space apart so that a realistic distribution of character errors would result, based on frequent (although not universal) practice of correcting shift errors by user action. A normal distribution between 1 and ? with a median of about 8 would be appropriate.

9.1 The issue of whether less than full rate transmission is an acceptable solution, if it can be shown to provide improved CER performance.

9.2 The User Requirements Document will be modified by the consumers before the December TR45 meeting.

APPENDIX D

TTY FORUM MANUFACTURER TESTING COMPLETION MATRIX

Manufacturer	Technology	Through Put Test (Contribution)	Type of Test (Field, Lab)	Contact Name & Number
Philips	Analog	98.07.21.07		Ken Wells
Motorola	Analog	98.05.20.20	Lab	Paul Mollar
Sendele	Analog	98.07.21.05	Lab	Steve Sendele
Motorola	CDMA	98.05.20.20	Lab	Paul Mollar
Lucent	CDMA	98.05.20.10	Lab	Ahmed Tauf
Lucent	CDMA	No Gain Solution 99.01.26.09	Lab	Dr. Steven Benno
Lucent	CDMA	99.09..09.16	Fixed Point Proof / Concept	Dr. Steven Benno
Nokia	CDMA	98.05.20.17	Lab	Mohamed El-Rayes
Qualcomm	CDMA	98.05.20.12	Lab	Nikolai Leung
Motorola	CDMA	99.05.18.15	Lab	
Ericsson	GSM	98.02.11.07	Lab	Christopher Kingdon
Nokia	GSM	98.05.20.17	Lab	Mohamed El-Rayes
Motorola	GSM	98.05.20.20	Static	Paul Mollar
Ericsson	GSM	98.11.04.14	Static	Steve Coston
Ericsson	All Digial	99.09.09.12 / .13	Static	Steve Coston
Nokia	GSM/TDMA	99.09.09.15	Theory	Doug Neily
Ericsson	TDMA	98.02.11.05	Lab	Christopher Kingdom
Ericsson	TDMA	99.01.26.10	Field	Steve Coston
Motorola	TDMA	98.05.20.20	Field	Paul Mollar
Nokia	TDMA	98.05.20.17	Lab	Mohammed El-Rayes
Philips/CPT	TDMA	98.07.21.07	Field	Jim De Loach 510-445-5510
Lober & Walsh	TDMA	98.09.08.10	Lab	Josh Lober
CPT	TDMA	98.07.21.08	Lab	Josh Lober
Ericsson	TDMA	98.11.04.14	Static	Steve Coston
AWS	TDMA	99.05.18.11	Static	Adrian Smith
NOKIA	TDMA	99.05.18.14	Lab	Massoud Fatini

Lucent	TDMA/CDMA	99.05.18.13	Lab	Steve Benno
Ameriphone	TDMA/CDMA	99.05.18.12	Static	Peter Lee
Lober & Walsh	IDEN	98.09.08.11	Lab	Josh Lober

APPENDIX E

TTY USER REQUIREMENTS

September 10, 1998

To: TTY Forum

Fr: Consumer Representatives

The CTIA has said that most of the consumer criteria previously submitted were not usable by the TTY Forum because the criteria covered marketing and distribution as well as design. Marketing and distribution issues for a possible "one-phone-model-per-technology" short-term plan will be taken up with CTIA's senior management, as suggested by them.

This contribution is a new set of criteria to address only functional characteristics of the solutions. The new criteria also reflect new information from the Forum since the first list was drawn up. It is intended to cover any solution.

1. The character error rate should approximate that of AMPS, which has been demonstrated at <1% for stationary calls. More research on AMPS performance with TTY would be useful to assist in specifying a range of conditions.

2. The TTY caller must be able to visually monitor all aspects of call progress provided to voice users. Specifically, the ability to pass through sounds on the line to the TTY (so that the user can monitor ring, busy, answered-in-voice, etc.) should be provided.

3. There must be a visual indication when the call has been disconnected.

4. A volume control should be provided.

5. The TTY user must have a means of tactile (vibrating) ring signal indication.

6. The caller must be able to transmit TTY tones independent of the condition of the receiving modem. (This is to permit baudot signaling by pressing a key, to let a hearing person know that the incoming call is from a TTY.)

7. The *landline* party's TTY must not require retrofitting in order to achieve the desired error rate.

8. The *wireless* party's TTY may require retrofitting, or a new model TTY to be developed, or the use of a portable data terminal such as a personal digital assistant.

9. VCO and HCO should be supported where possible.

10. Reduction of throughput (partial rate) on Baudot is highly undesirable and should not be relied upon to achieve compliance (see #7). It may be useful as a user-selectable option to improve accuracy on a given call.

11. Call information such as ANI and ALI, where provided in wireless voice, should also be provided for TTY calls.

12. The solution need not support little-used or obsolete TTY models, but in general should support the embedded base of TTYs sold over the past ten years. The landline equipment supported must not be limited to that used in Public Service Answering Points (911 centers).

13. Drive conditions must be supported, again using AMPS as a benchmark.

September 14, 1999

To: TIA TR-45.3

Fr: Consumer Representatives, Wireless TTY Forum
Authors: Judy Harkins, Gallaudet University and Dick Brandt, dB Consulting as consultant to Gallaudet
David Baquis, Self Help for Hard of Hearing People, Inc.
Alfred Sonnenstrahl, Consumer Action Network
Claude Stout, Telecommunications for the Deaf, Inc.
Karen Peltz Strauss, National Association of the Deaf
Norman Williams, Gallaudet University

Re: Guidance to TR-45 on Proposals for Solutions to TTY over TDMA

Presentations on three of the proposals being considered by TR-45 for the TDMA TTY solution were made at the September 9, 1999 meeting of the Wireless TTY Forum. Given the timeframe TR-45 is operating under, and given that the FCC has directed industry to consider consumer issues in determining solutions, we offer this document as guidance to TR-45 as it considers the alternatives.

The information presented at the September 9 meeting was, in some cases, sufficiently sketchy that consumers were unable to ascertain the functional implications of the proposals. Some presentations were also done very late in the process, so there is not sufficient time for analysis.

We do not state a preference for any proposal but hope the following discussion will be helpful.

General Questions and Issues:

1. There is a concern among consumers about the implications of roaming among digital technologies in the future, if a variety of approaches for TTY access are used. Thus we believe consistency in approach across technologies is needed. One of the carriers also strongly expressed this view. This problem needs to be solved for the long term, not just for the current situation where roaming tends to go to the more-accessible analog network. Once these solutions are implemented, if problems arise, consumers will have great difficulty having them addressed because the solutions are within the network and customer service personnel will not be equipped to deal with them.

2. Has there been any analysis indicating that approaches which propose network changes in switches versus changes in base stations, would lead to earlier availability as claimed? Consumers are interested in seeing solid, lasting and effective solutions, and the speed of implementation, while important, should not override usability considerations.

3. All test results presented to date have been obtained using blocks of data sent out from a file stored either in a TTY or in a computer and sent via a TTY modem. It has been noted in tests

run by Gallaudet that results obtained in an interactive mode (two people typing to each other) yielded poorer accuracy. Thus proposals that show errors in transmission should be scrutinized carefully. A full range of system impairments has either not been used in simulation testing or not reported on all of the solutions.

4. Non-activated phone support for 9-1-1 calls is required by the FCC. Has this been considered in the proposals? (See class mark discussion below.)

Appraisal of Specific Solutions:

Vocoder solution. From a consumer perspective, the Lucent "no gain" solution has been most thoroughly presented and appears to have the most transparent accessibility and the most support for consumer needs and requirements. The inclusion of error correction is a major benefit, given that the air interface presents new challenges to TTY transmission. Other, comparable proposals may also have merit (e.g., Nokia), but they have not been thoroughly explained so that consumers can compare them.

Code conversion. The Ericsson (and Nokia?) Code conversion ("tone") proposals appear to offer the possibility of earlier implementation (see 2 above) and the ability to use many existing handsets, but have the potential of putting the retrofit burden on the consumer. They raise the following concerns:

1. Smart Cable: Consumers are not opposed to the idea of including intelligence in the cable per se, however the following concerns exist:
   1.1. How would this intelligence be powered? (This question could not be answered at the Sept. 9 meeting.) There is opposition to the requirement for an additional battery for reasons of cost, bulk, and reliability.
   1.2. Who would make and provide the cable?
   1.3. Would this intelligence be built into the regular cable product line or would this be a primarily or exclusively "deaf" product? If the latter, experience shows that provisioning and cost may be serious problems. Customers often have to wait many weeks for "special" accessories. We realize standards bodies do not ordinarily address cost issues, but please consider the additional cost of a phone that vibrates (over a low-end phone), the cost of the TTY, and now the potentially high cost of a special-purpose cable with a small market.
   1.4. Would one cable fit all (thereby lowering the price and expanding the availability)?

2. Class Mark: Any system that relies on the phone having a class mark denoting that the user uses a TTY is not likely to be successful, because many deaf and hard of hearing people consider self-identification as a possible threat to their security. 9-1-1 operators have never been successful in having deaf and hard of hearing subscribers "sign up" as a TTY telephone number. The procedure is fraught with potential problems and snafus. When someone roamed into a carrier using this solution (not marked), what would happen? Hearing people who use TTYs may not realize they need to enroll their phones. People who have a phone and acquire a TTY later (e.g., after onset of hearing loss) would find the TTY does not work. TTY users could not use someone else's cell phone. One solution to this problem suggested

at the forum was to mark all phones as TTY. Would carriers agree to this? In short, a system that provides automatic detection of the TTY signal is preferable.

IWF. Although we recognize that IWF proposals are not a part of the present TR-45 TDMA TTY discussions we would also like to provide the following for your information, as they should be considered in development of proposals:

1. There is a strong desire for VCO/HCO capability, which appears to be difficult to implement in IWF solutions at the present time.
2. There is also a strong desire for provision of the line signal power indicator (flickering light) used to interpret call status.
3. Consumers are opposed to (and the DOJ has mandated against) requiring any form of special dialing (e.g., two-stage) or conditioning sequences (e.g., #NN) to reach 9-1-1.
4. It will be important that the delay between powering on a data device and dialing out not exceed the delay experienced with a voice call.

Appendix: Consumer requirements with comments regarding proposed solutions:

1. The character error rate should approximate that of AMPS, which has been demonstrated at <1% for stationary calls. More research on AMPS performance with TTY would be useful to assist in specifying a range of conditions.

Comment: All proposals presented to date appear to meet this criterion. Consumers are concerned that there be sufficient testing to validate this in the field.

2. The TTY caller must be able to visually monitor all aspects of call progress provided to voice users. Specifically, the ability to pass through sounds on the line to the TTY (so that the user can monitor ring, busy, answered-in-voice, etc.) should be provided.

Comment: All proposals claim to meet this criterion and we have no concerns. (IWF solutions may, however, not be able to meet this one.)

3. There must be a visual indication when the call has been disconnected.

Comment: This specific issue has not been addressed in presentations but is covered by most if not all systems by a message on the display of the phone.

4. A volume control should be provided.

Comment: This item is intended to allow the TTY user to adjust volume for better reception of TTY tones as necessary. Most if not all handsets include this feature anyway. It has not therefore been addressed in presentations on solutions.

5. The TTY user must have a means of tactile (vibrating) ring signal indication.

Comment: Again, this is an issue of general provisioning and not related to voice-channel solutions. (However, this will be an issue in IWF solutions.)

6. The caller must be able to transmit TTY tones independent of the condition of the receiving modem. (This is to permit Baudot signaling by pressing a key, to let a hearing person know that the incoming call is from a TTY.)

Comment: All voice-channel solutions to date appear to support this.

7. The *landline* party's TTY must not require retrofitting in order to achieve the desired error rate.

Comment: All solutions to date appear not to require retrofitting of the landline TTY.

8. The wireless party's TTY may require retrofitting, or a new model TTY to be developed, or the use of a portable data terminal such as a personal digital assistant.
Comment: Solutions that do not require retrofitting or special treatment are preferred by consumer representatives.

9. VCO and HCO should be supported where possible.

Comment: Voice-channel solutions presented to date appear to support this requirement. (IWF solutions may not, however.)

10. Reduction of throughput (partial rate) on Baudot is highly undesirable and should not be relied upon to achieve compliance (see #7). It may be useful as a user-selectable option to improve accuracy on a given call.

Comment: No solution presented to date reduces throughput, as nearly as we can tell. This should be verified with the companies proposing solutions.

11. Call information such as ANI and ALI, where provided in wireless voice, should also be provided for TTY calls.

Comment: Voice channel solutions should not cause a problem with this.

12. On the landline side, the solution need not support little-used or obsolete TTY models, but in general should support the embedded base of TTYs sold over the past ten years. The landline equipment supported must not be limited to that used in Public Service Answering Points (911 centers).

Comment: This is of concern because of limited testing of solutions to date.

13. Drive conditions must be supported, again using AMPS as a benchmark.

Comment: This requirement has not been adequately addressed by testing.

Appendix E
TTY/TDD Forum – 18

June 12, 2001
ATIS Conference Center
1200 G Street, NW, Suite 500
Washington, DC

TTY User Intervention (*i.e.*, mode switch)

Questions:

1. How often does this have to be done?
2. How many steps are there?
3. How complicated are the steps?
4. Is it easily discovered without using the user's manual?
5. Is it clearly documented?
6. Is there a visual status indication?
   - During set-up?
   - Ongoing?
7. Does the TTY mode setting interfere with the operation of other features of the handset or system? (e.g., does connecting the cable or enabling the TTY mode disable the vibrate feature or the direct dialing capability?)
8. Will it be possible to make a voice call while in TTY mode?
9. Will VCO be a choice or will it be supported as a TTY mode? (Will VCO be incorporated into this mode or is there a series of choices in TTY mode?)
10. How long does it take? How fast can you set it up?
11. Is it possible to change modes during a call?
12. Is it standardized across handsets?
13. Is the process of hooking up the equipment and putting it into TTY mode too long or arduous to be able to answer a call in time?[1]
14. When receiving an incoming call, does the phone vibrate? Does the vibrator continue to work when an audio cable is inserted into the jack?

[1] Can a user set up the equipment and get into TTY mode before the call is disconnected or goes to voicemail? Can the phone be answered prior to being connected to equipment?

Notes on Evaluating Solutions against the User Requirements List

Judy Harkins and Norman Williams, Gallaudet University, May, 2001

Some of the carriers have indicated a need to include in their tests and evaluations all of the user requirements generated in 1998 in the TTY Forum. This document annotates the requirements with notes about evaluation issues and field test procedures from a user perspective. This is obviously not a test plan but is sent out primarily for generating discussion and giving general guidance from the user viewpoint.

1. The character error rate should approximate that of AMPS, which has been demonstrated at <1% for stationary calls. More research on AMPS performance with TTY would be useful to assist in specifying a range of conditions.

See appendix.

2. The TTY caller must be able to visually monitor all aspects of call progress provided to voice users. Specifically, the ability to pass through sounds on the line to the TTY (so that the user can monitor ring, busy, answered-in-voice, etc.) should be provided.

Suggestion: Generate all audio call progress signals (ringing, busy, fast busy, voice answer) and determine if there is an understandable visual indication for each. The line status light on the TTY will probably function appropriately in voice channel solutions, but this should be verified. Check that the visual indication is synchronized in time with the audio indication.

Comment: A particular issue in wireless telecommunications is that call to mobile phones often do not ring at all if the party is unavailable; a voice message is provided instead. There may not be a visual indication of the call status on the telephone. Another issue is that many phones revert to voice mail. In these situations, the TTY caller will not be able to monitor all aspects of call progress provided to voice users.

3. There must be a visual indication when the call has been disconnected.

Suggestion: Place call and have other side hang up. What visual indication is given? If the user can tell, by looking at the handset for example, that the call is terminated, then this criterion is met.

Comment: It would help all users to have an explicit message, but if this is not provided, the user should know what the screen will look like upon call termination.

4. A volume control should be provided.

Comment: Determine and document the optimum volume control setting for the TTY being tested. (If performance is affected by volume control, users will need to be informed of this, and how to use the volume control to obtain a low error rate.)

5. The TTY user must have a means of tactile (vibrating) ring signal indication.

Suggestion: Verify that the handset or accessory vibrates on receipt of calls (and preferably not at other times!). Can the tester receive calls in a timely fashion with the ringer turned off? (Test throughout the call; some external vibrators continue to vibrate throughout a call, which can be confusing.)

6. The caller must be able to transmit TTY tones independent of the condition of the receiving modem. (This is to permit Baudot signaling by pressing a key, to let a hearing person know that the incoming call is from a TTY.)

Suggestion: On outgoing call, press keys on the TTY during ring signals and immediately after answer. Baudot tones should be clearly audible by the answering party. (This should not be a problem for voice channel solutions, but is worth some quick tests in the field.)

7. The *landline* party's TTY must not require retrofitting in order to achieve the desired error rate.

Comment: This issue appears to be moot and does not need to be tested.

8. The *wireless* party's TTY may require retrofitting, or a new model TTY to be developed, or the use of a portable data terminal such as a personal digital assistant.

Comment: This is not an issue for testing. However, if an accommodation is required, such as retrofitting, a special model, or a cable, this should be well documented so that consumers know what types of equipment they will need. If PDAs or paging devices are used in place of a handset and TTY combination, attention will need to be paid to the rate of input that can be achieved through the keyboard or virtual keyboard.

9. VCO and HCO should be supported.

Suggestion: Evaluating the efficacy of VCO and HCO:

- VCO and HCO should be tested as they will be implemented. For example, if a custom cable is needed, tests should be run with that cable as part of the set-up. If the user needs to take action between turns (e.g., pushing a button), it should be tested with consumers to check usability.
- Does the system deliver acceptable error rates with devices on the market that are designed to work in VCO and in a mobile environment? (Ameriphone Q90, Krown Pocket VCO, and the Ericsson handset adapter are the three known examples.)
- Is the quality of voice on VCO calls the same as on non-TTY calls? This can presumably be tested using standard industry methods for voice quality.

- Is there any delay or cut-off of characters or words when switching between voice and TTY?
- Is there greater chance of disconnect when switching between voice and TTY? Other problems?

10. Reduction of throughput (partial rate) on Baudot is highly undesirable and should not be relied upon to achieve compliance (see #7). It may be useful as a user-selectable option to improve accuracy on a given call.

This issue is now moot, and no tests are needed.

11. Call information such as ANI and ALI, where provided in wireless voice, should also be provided for TTY calls.

This would not appear to be a problem on voice channel solutions. On data channel solutions, the call would need to carry the same identifying information as would be carried were it in the voice channel.

12. On the landline side, the solution need not support little-used or obsolete TTY models, but in general should support the embedded base of TTYs sold over the past ten years. The landline equipment supported must not be limited to that used in Public Service Answering Points (911 centers).

A variety of TTY models should be tested, but the amount of testing on each model will necessarily vary. The difficulty in testing with a large number of models is acknowledged, given the limitations in data capture possibilities with TTYs and some 911 TTY systems on the market. This may have to be handled by short tests – calling to direct-connect landline TTYs set to auto answer, where the tester can call send a string of identifying information about the call, which can then be sent back to the tester for scoring. This might be able to be arranged at Gallaudet if there is interest; more discussion is welcome. (Note that Gallaudet has produced some software tools and documentation for partially automated two-way TTY testing: www.tap.gallaudet.edu/ttytools

13. Drive conditions must be supported, again using AMPS as a benchmark.

Tests for drive conditions should be run using carriers' individual methodologies and facilities. The consumer's goal is to be able to use the TTY and telephone while a passenger in a car, while on a train, etc.

Appendix User Requirement 1: Error rate of TTY over Wireless telephones

- Interoperability among handsets and infrastructure vendors should be tested using industry's usual tests.

- Varying signal conditions need to be tested.

- Varying network conditions need to be tested.

- Data should be collected and scored on both sides (directions) of the call wherever possible.

- See Requirement 12 on accommodating a range of TTY models. Compatibility testing with 9-1-1 TTY equipment should be coordinated via Toni Dunne.

- See Requirement 13 on drive tests.

- Calls through relay should be placed. A hearing person on the landline side should read one side of the script. (This is an example of where random characters will not be helpful). Relay operators cannot retain conversations; unless special arrangements can be made with TRS providers for test calls, the only way to ascertain is to ask the relay operator if the incoming text was garbled.

- We tentatively recommend that Lober and Walsh's SCORE program be used as this was developed through the TTY Forum. There is some indication based on limited tests that the Ericsson program results in a higher error rate.

- Scripts: A few comments -- Consumers have had the concern that the error rates generated by the TTY Forum's random character set may be inflated due to the excessive number of register shifts (sending a shift character between each figure/letter transition) in this script. It is not possible to eyeball the results in the field because of the random characters. The random character file also transmits only at full rate – there are no pauses.

Matt Kaltenbach of Ericsson has suggested that it would be helpful to base at least one script on the bit structure of Baudot or some other mathematical basis that would allow for diagnosis of problems in the field.

Gallaudet has produced a series of scripts that use conversational language and naturals shifts between letters and figures, pauses in typing and simulation of two typing speeds. These are available at http://tap.gallaudet.edu/ttytools

Comment on the 1% benchmark: It was our intention, when we wrote this requirement, that 1% would apply to reasonable signal conditions and network conditions, and *not* that a maximum of 1% error rate must be met on every single call in the presence of severe (and rarely occurring) impairments.

APPENDIX F

WORK PLAN

Published as a separate TTY Form Document

APPENDIX G

Typical Operating Characteristics for Wire-Line Based TTYs

The following is a technical description of the typical operating characteristics for existing wire-line based Text-Telephones for the Deaf (TTYs). This document is not intended to be a performance description of any one product, but to give a representation of performance of the majority of the product supplied to wire-line TTY customers in the last five years. TTY manufacturing representatives has reviewed this information and agrees that it represents an accurate account of the performance characteristics of existing wire-line products.

It should be noted that it is not possible to precisely define performance for all products, in all situations, in the field. Variation beyond this technical representation does exist for older product, products that are no longer supported by a manufacturer, individual products that are not operating correctly and improper use of product. It is not possible to report this additional range of variation, only to say that these products performance would suffer on either a connection to wire-line or wire-less TTY.

TECHNICAL BACKGROUND

For Frequency Shift Keying (FSK) two signal frequencies are required to modulate the asynchronous serial data to be sent over the conventional voice grade telephone lines of the switched telephone network. For Baudot communications to be useful on the Public Switch Telephone Network (PSTN) these frequencies fall within the central portion of the telephone line pass-band (300 – 3300 Hz).

The two frequencies of the transmitted signal must be sent in accordance with FCC requirements defined in dBm (decibels with reference to a power of one milliwatt for metallic connections, where 0 dBm = 1 milliwatt). The acoustic measurements are in dBSPL for acoustic configurations. This signal is measured at the TTY interface, either at the metallic connections or where it is acoustically coupled to the telephone network.

The receive level, commonly referred to as sensitivity, is also given for each pair of frequencies. This signal, also measured in dBm for direct connections and dBSPL for acoustic configurations, is the typical signal measured at the connection that will result in error-free reception of a test message.

BAUDOT CODE OPERATION

All TTYs provide Baudot code operation employing half-duplex, simplex, asynchronous, FSK transmission.

Frequencies

Baudot code operation used the following frequencies:

Signal	Frequency	Tolerance	
		Transmit	Receive
Mark	1400 Hz	±1%	±4%
Space	1800 Hz	±1%	±4%

Bit Duration

The bit duration is 22.00 milliseconds (ms) ±0.40ms to provide a nominal baud rate of 45.45 bits per second.

CHARACTER FORMAT

Transmit

The Baudot code for each character is transmitted with the following format, the data bits assigned are in accordance with Table 1.2 with a “1” in the binary representation transmitted as a mark and a “0’ as a space.

Bit	Start	Data	Data	Data	Data	Data	Stop
Signal	Space	LSB	Bit 2	Bit 3	Bit 4	MSB	Mark
Number of Bits	1	1	1	1	1	1	1.5-2.0 2.0 Typ.

Table 1.1

Where the LSB is the Least Significant Bit and the MSB is the Most Significant Bit. The bits shall be transmitted from left to right.

Receive

The TTY is capable of receiving characters with the format of Table 1.1 with a stop bit of at least 1.0 bit length or longer. The receiver is capable of receiving characters either with the space tone of the start bit as the first tone received or with a mark tone preceding the start bit.

Mark Hold Time

The mark hold time defines an additional period of time during which the TTY transmits a mark hold tone (1400 Hz) following the last character transmitted. Mark hold tone is not transmitted between each character if the character is followed immediately by another character. The mark hold tone is transmitted for a period between 150ms to 300 ms after the end of the stop bit(s).

Transmit Levels		
Coupling Method	Level	Range
Acoustic Direct Connect	108 dBSPL -10 dBm	±6 dB * - 3 ,+1 dB

Sensitivity Levels		
Coupling Method	Level	Range
Acoustic Direct Connect	72 dBSPL -40 dBm	±6 dB * ±5 dB

Most receivers are capable of receiving signal up to at least –5dBm.

* NOTE: Acoustic performance variations greater than listed may be encountered and are a result of many variables including the type of telephone handset used and how well the acoustic coupling is made by the user. It is not possible to report this additional range of variation, only to say that these products performance would suffer on either a connection to wire-line or wire-less TTY.

TABLE 1.2

Set of Baudot Codes for TTYs

DEC	HEX	BINARY	LETTER	FIGURE
0	00	00000	BackSpace	BackSpace
1	01	00001	E	3
2	02	00010	LF	LF
3	03	00011	A	-
4	04	00100	Space	Space
5	05	00101	S	
6	06	00110	I	8
7	07	00111	U	7
8	08	01000	CR	CR
9	09	01001	D	$
10	0A	01010	R	4
11	0B	01011	J	‘
12	0C	01100	N	,
13	0D	01101	F	!
14	0E	01110	C	:
15	0F	01111	K	(
16	10	10000	T	5
17	11	10001	Z	“
18	12	10010	L	)
19	13	10011	W	2
20	14	10100	H	=
21	15	10101	Y	6
22	16	10110	P	0
23	17	10111	Q	1
24	18	11000	O	9
25	19	11001	B	?
26	1A	11010	G	+
27	1B	11011	FIGS	FIGS
28	1C	11100	M	.
29	1D	11101	X	/
30	1E	11110	V	;
31	1F	11111	LTRS	LTRS

Note: CR and LF may be manually or automatically generated by the TTY. If automatic generated, the sequence may contain an extra (non-printable) character to provide adequate time for older electromechanical TTYs to respond. CR & LF are inserted into the transmitted characters after a maximum of 72 characters to allow for the carriage return of older electromechanical TTYs.

APPENDIX H

Modem / IWF Manufacturer Contact List

List of Names and Addresses to Receive IWF Letter

FirstName	LastName	Company	Address	Address2	City	State	Zip
Veda	Krishnan	Cirrus Logic	110 Horizon Dr	#300	Raleigh	NC	27615
Zarko	Draganic	Alto Com Inc.	257 Castro St	Suite 233	Mountain View	CA	94041
Edward	Campbell	3Com					
Raouf	Halim	Rockwell	4311 Jamboree Rd		Newport Beach	CA	92660
Aaron	Fisher	Lucent	Room 55F-311	1247 S. Cedar Crest Blvd.	Allentown	PA	18105
Judy	Sheff	Lucent	Room 5SF18	2 Oak Way	Berkeley Heights	NJ	07922
Greg	Garen	Lucent Technologies - Microelectronics Group	Room 22W-219(Mail Stop EQ)	555 Union Blvd.	Allentown	PA	18103
Warren	Henderson	Henderson Laboratories					
Moiz	Beguwala	Rockwell	4311 Jamboree Rd		Newport Beach	CA	92660

CC: National Association of State Relay Administration (NASRA)
Merilyn Crain, Chair
315 So. College Rd. Suite 208
Lafeyette, LA 70503

APPENDIX I

TTY Forum Chair's Update Memorandums

IWF letter dated November 16, 1998

Sent to:
3Com
Mr. Zarko Draganic, CEO, Alto Com Inc.
Ms. Veda Krishnan, (to be supplied) Cirrus Logic
Mr. Aaron Fisher, Vice President, Wireless Products, Lucent Technologies
Ms. Judy Sheff, VP Intellectual Property, Lucent Technologies
Mr. Greg Garen, General Manager Modem and Multimedia Products Lucent Technologies - Microelectronics Group
(To be supplied), Motorola
Mr. Raouf Halim VP and General Manager, Network Access Division, Rockwell Semiconductor Systems
Mr. Moiz Beguwala, VP and General Manager, Personal Computing Division, Rockwell Semiconductor Systems

Dear Sir/Madam

In response to a FCC inquiry, the Cellular Telecommunications Industry Association (CTIA) and the Personal Communications Industry Association (PCIA) have established a technical forum to address the issue of providing reliable communications for deaf and hard of hearing people over digital wireless systems. Specifically this forum is addressing the issue of deaf and hard of hearing people using digital wireless connections to access 9-1-1 centers.

A solution that appears to offer promise for the longer term, involves the use of new (or modified) communications terminals, used by deaf and hard of hearing people, (TTYs) connected through a serial interface to the digital cell phone. The data channel, provided by the air interface, would then be used to effectively extend this interface to the network. This of course, would require the use of an Interworking Function (IWF)*[2] in the network that would be capable of supporting TTY communications. We are aware that some of the IWFs being developed will support 45.45 Baudot TTY transmission (the transmission mode most commonly used by deaf and hard of hearing people in the United States). While this caters well to the present need, it has the drawback that it locks deaf and hard of hearing people into this older technology.

A more desirable solution would be one which would involve the use of ITU-T Recommendation, V.18, that specifies a protocol, which provides for higher speed ASCII based communications while at the same time maintaining compatibility with today's Baudot TTY devices. The problem with this solution is that V.18 has yet to be implemented by any major modem manufacturer. We have, however, been given a presentation by a UK based company that has developed a prototype "stand alone" V.18 product which it plans to introduce commercially early next year. In addition to this, we have been given a demonstration of an in-service Swedish IWF, which incorporates V.18 functionality. It might also be of interest to note

[2] The term IWF is used in its broadest sense in this letter. (See the definition in TIA TSB-100)

that the service provider sees text telephony as a generic service (e.g. not just for deaf or hard of hearing). These two events may be moving V.18 into the readily achievable category.

It seems likely that if the IWF function and the modems installed at the 9-1-1 centers were to incorporate V.18 capability, connections could be made at the higher V.18 rates. Likewise it would appear that the connect time could be shortened as V.18 incorporates a calling tone, which could be instantly recognized by equipment at the 9-1-1 centers, thereby eliminating the loss of precious time, which is normally incurred while attempting to determine the source of a "silent" call.

Assuming that you agree that the timely provision of this functionality is important, we are hoping that you can provide us with an indication of when we might expect to see products (e.g. consumer modems, IWFs) from your company that implement V.18. Any information you could provide to us, by 4th Quarter 1998, would greatly help us in developing our response to the FCC.

Date: March 22, 1999

FM: TTY Forum Co-Chairs; Ed Hall, CTIA and Todd Lantor, PCIA
TO: TTY Forum Members and Interested Parities

RE: TTY Forum Update

Greetings,

A recent conversation with Dr. Steven Benno of Lucent Technologies has informed us that he has completed the Lucent software simulation of the TTY "no-gain" solution and it is now released and available to all those interested in exploring its functionality, compatibility and potential benefits with various CLEP vocoders. According to Dr. Benno, the following equipment and infrastructure vendors have requested a copy of his newly released code for testing purposes; Ericsson, Motorola, Nokia, NORTEL and Qualcomm. As co-chairs, we remain hopeful that this Lucent contribution will spark an interest for some manufacturers to re-visit their past efforts with vocoders, which perhaps may lead to follow-on contributions at our next TTY Forum.

During the last TR45 meeting, (March 3-4) CTIA submitted the 2.5mm Jack SRD, on behalf of the Forum. TR45 accepted this contribution and remanded it to the TDMA (TR45.3) and CDMA (TR45.5) sub-committees for information and to the appropriate sub-committee (TR45.1) for Action. Likewise, the TDMA and CDMA sub-committees reported back to the Chair that both of these digital technologies have developed standards supporting the Inter-working Function (IWF) as described in the TTY Forum's SRD on Circuit Switched Data submitted during the December TR45 meeting. This news brings the industry one step closer to the Forum's proposed "long term" data solution. The willingness of some modem manufacturers (3COM) to support the V.18 protocol is the other critical issue needed to make the IWF a viable option to carriers as a means of supporting TTY over digital - long term. The IWF solution opens the doors to the future by allowing end-users the use of ultra-light computers, compact PDA's, etc.

At this point I think it is important to remember that it has been the synergy, team-spirit and positive environment provided by the members of the TTY Forum that has lead us to this point. But, we do not want anyone to have the false impression that the end-all, be-all solution(s) have thus far been developed. Although Dr. Benno's "no-gain" solution remains a major breakthrough for TTY, "short term", voice based (specifically CLEP vocoders) solution and the V.18 protocol a major breakthrough for TTY "long term", data solution these by no means require carriers or manufactures to implement anyone one or both of these solutions. Keep in mind the other solutions brought to the Forum by Lober and Walsh and Ericsson. These solutions have also proved to be quite successful and promising for certain digital technologies. It is important to keep in mind that the carrier is responsible for the selection and implementation of a solution(s) that will allow TTY users to access 9-1-1 over its digital system. The best we as a Forum can do at this point is continue to provide the positive environment, feedback and input to manufacturers and carriers regarding testing and consumer needs and requirements and keep the standards development bodies involved when needed. CTIA and PCIA remain committed.

In conclusion, we propose that at the next TTY Forum we initiate the process to develop the final report to the FCC. Based on the contributions received to date and those anticipated at our next meeting, we believe we will have sufficient information to develop specific comments and recommendations. The TTY Forum can then plan to meet on a quarterly basis to "evaluate" progress and provide the FCC with a periodic, implementation status report.

My thanks to all members of the TTY Forum. Looking forward to seeing everyone in May.

July 23, 1999

Fm: TTY Forum Co-Chairs
TO: TTY Forum

RE: Update: TTY Forum and Interested Parties

Todd Lantor and I would like to take this opportunity to provide you with an overview of some interesting developments that have come to our attention since the last Forum held on May 18th, 1999.

The Lucent "no gain" vocoder solution has been widely accepted by TR45.5, the CDMA air-interface standards group. The "no gain" solution draft standards document has recently been prepared for ballot. Assuming a "clear" ballot response, the industry may have a CDMA TTY standard as early 4Q99. Likewise, TR45.3, the TDMA air-interface standards group is actively pursing the same course as the CDMA group. The Nokia variation, presented to the Forum during the May meeting is being reviewed and considered. The group plans to complete its deliberation quickly and move toward the final stages by preparing a draft document for ballot.

Ericsson has provided the co-chairs with a copy of a document that proposes an alternative approach to the Lucent "no gain" vocoder solution. In the interest of time, and to take advantage of the TR45.3 meeting cycle, Ericsson thought it prudent to submit the alternative approach directly to the TDMA working group. Although it is being discussed at standards, Ericsson will present this vocoder alternative at the upcoming September TTY Forum.

Concurrently, we are preparing a draft "TTY Forum Status Report" for the FCC. The report, as a minimum, will contain the following sections:

- Updated Work Plan
- TTY testing completed to date
- A Technical Standards Update
    - Voice Based Approach
    - Data Approach
- Comments and Recommendations

Todd and I plan on getting a draft of this report to the TTY Forum Steering Committee for their review and approval before the next TTY Forum: The Steering Committee is comprised of: Toni Dunne, Texas 9-1-1; Billy Ragsdale, Bell South; Claude Stout, TDI; Norm Williams, Gallaudet UN; Jeff Crollick, TIA; John Melcher, NENA.

Next Meeting: We are currently making arrangements for the **September 9**, **1999** TTY Forum and will get the meeting logistics out separately.

The meeting will be in the **Washington DC** area but WILL NOT be at Gallaudet Univ. Their calendar cannot support us. The meeting will start at **9:00 AM** and adjourn at 5:00 PM. Please do not make travel arrangements leaving the DC area before 6:30 PM. Now that we have reduced the meetings to one day, I see this Forum's agenda as being quite full.

Thank you all and have a very cool and pleasant summer. See you September!

Appendix J

Technical Standards Reference

ID	Description
TIA/EIA 825	FSK Modem
TIA/EIA TSB-121	Cellular Subscriber Unit Interface for TDD
TIA/EIA-IS-823-A (PN-4614)	TR 45.3 5.3 TDMA TTY Solution- 410 vocoder
TIA/EIA-IS-840-A (PN-4721)	TR 45.3 5.3 TDMA TTY Min Performance.
TIA/EIA/IS-789-A:	Electrical Specification for the Portable Phone to Vehicle -
IS-733-2, IS-127-3	CDMA Vocoder Standards - high rate
IS-707-A-2	CDMA Data (V.18) Standard
3GPP2 C.S0028	CDMA TTY/TDD Minimum Performance Specification
TIA/EIA-136-270-B	TDMA Third Generation Wireless – Mobile Stations Minimum Performance
TIA/EIA-136-280-B	TDMA Third Generation Wireless – Base Stations Minimum Performance
3GPP TS26.226	Cellular Text Telephone Modem Description
3GPP TS26.230	Cellular Text Telephone Modem Transmitter Code
3GPP TR26.231	Cellular Text Telephone Modem Minimum Performance Specifications
ETSI ETR 333	Text Telephony, User Requirements and Recommendations
ITU-T Rec. v.61	Analog simultaneous voice and data (permits VCO with ASCII modems)
ITU-T Rec. V.18	Operational and Interworking Requirements for DCE's operating in the Text Telephone Mode
ITU-T Rec. V. 250	Serial asynchronous automatic dialing and control

ITU-T Rec. V.8	Procedures for starting sessions of data transmission over the public switched telephone network
T1.718	PCS 1900 Cellular Text Telephone Modem (CTM) Transmitter Bit Exact C-Code
T1.719	PCS 1900 CTM General Descriptions
T1.720	PCS 1900 CTM Minimum Performance Requirements
TIA/EIA-688	DTE/DCE Interface for Digital Cellular Equipment

Timeline of Events in CDMA and TDMA standards

CDMA: TIA TR45.5.1.1
==========
August 2000: Lucent proposed bug fixes to the TTY/TDD addenda and proposed a TTY/TDD Minimum Performance Specification for CDMA.

November 2000: Nortel proposes to add a test vector to the Min Perf Spec in order to handle the hard handoff scenario. This scenario uncovers another bug in the code.

Dec 2000: Lucent proposes another bug fix, which is approved, but the subcommittee doesn't baseline the fixes in order to give more time to find problems.

Jan 2001: Updates to the TTY specifications and Min Perf Specs are baselined and sent to V&V.

TDMA: TIA TR45.3.5
==========
October 2000: Proposed bug fixes to IS-823 TTY Extension to TIA/EIA 136-410.

December 2000: Proposed additional bug fix similar to the bug fix proposed for CDMA in Dec. 2000.

January 2001: Nokia and Ericsson present contribution questioning the necessity of any bug fixes. Nokia proposes change to standard to improve TTY performance during signaling.

February 2001: A problem is found with IS-840 TTY/TDD Min Perf Spec for TDMA. Nokia (the editor) will provide an update to fix problem and update based on Nokia's proposed change to IS-823.

March 2001: Changes to IS-823 are approved. Nokia commits to having a new version of IS-840 for review by next meeting. The subcommittee decides to ballot new versions of IS-823 and IS-840 together.

APPENDIX K

Glossary of Terms

Telecommunications Standards and Assignment Organizations

ANSI - American National Standards Institute

The ultimate accolade for any standard is ANSI certification. This does not mean that ANSI has reviewed the standard, but that it has been circulated widely throughout the industry and that it conforms to their document design and publication guidelines. TIA standards, for example, start their public life as an IS- (Interim Standard) and then proceed within a few years to a full ANSI standard. The analog cellular standard started as EIA/TIA IS-3 and is now the ANSI standard identified as EIA/TIA-553.

ATIS - Alliance for Telecommunications Industry Solutions

The major US telecom standards organization beside the TIA, most responsible for ANSI SS7 standards. This organization was previously called ECSA; Exchange Carriers Standards Association. SS7 and wireless standards are developed within the T1 committee.

Bellcore - Bell Communications Research

Bellcore is not a standards organization, but they do write technical documents that are treated as if they were standards by many telecommunications carriers, particularly their former owners, the 7 regional bell operating companies. These documents include the GR-145 specification for interconnect, enhanced SS7 specifications beyond ANSI and the WACS low-mobility PCS system. Bellcore also performs many other research and consulting functions.

ETSI - European Telecommunications Standards Institute

The mission of ETSI is "to produce the technical standards which necessary to achieve a large unified European telecommunications market". This includes the specification of the GSM cellular and PCS standard.

IFAST - International Forum on ANSI-41 Standards Technology

A forum on international cellular carriers, vendors and service providers that attempts to resolve international roaming problems with AMPS-compatible systems (i.e. including IS-136 D-AMPS and IS-95 CDMA). The organization has taken responsibility for allocating the International Roaming MIN resources (MIN's starting with the digits 0 or 1) and new blocks of SID codes.

INC - Industry Numbering Committee

The Industry Numbering Committee (INC) is a standing committee of the Carrier Liaison Committee (CLC). The INC provides an open forum to address and resolve industry-wide issues associated with the planning, administration, allocation, assignment and use of resources and related dialing considerations for public telecommunications within the North American Numbering Plan (NANP) area.

ITU - International Telecommunications Union

The ITU is the global equivalent of ANSI for telecommunications standards. In fact, the world is divided into the majority of countries that adhere to ITU standards, and the US and Canada that tend to use ANSI standards. AMPS cellular is an exception, as it

has been implemented in many other countries. ITU standards that are used in AMPS cellular include: E.164 - the global numbering plan. E.212 - the global mobile identification plan. Q.7xx - a series of standards defining Signaling System #7 (used as an alternative to ANSI SS7 in AMPS countries outside the US and Canada).

NANPA - North American Numbering Plan Administration

The organization responsible for allocating numbering resources within the North American Numbering Plan Area: USA, some of its territories, Canada and several Caribbean nations. Controlled by Bellcore until January 1998, it is now managed by Lockheed-Martin. It is responsible for assignment of new area codes within the North American Numbering Plan and office code assignments within US states and territories.

NENA - National Emergency Number Association

NENA, along with NASNA (National Association of State 9-1-1 Administrators), APCO (Association of Public Safety Communications Officials) and the TIA are responsible for promoting enhanced 9-1-1 standards for wireless systems.

TIA - Telecommunications Industry Association

WWITF – Wireline Wireless Integration Task Force

Government and Regulatory Organizations

Australian Communications Authority (ACA)

The organization responsible for the management of radio spectrum and telecommunications in Australia, formed by a merger of AUSTEL and SMA. APUMP represents people who are unhappy with the decision to eliminate analog cellular by the year 2000 in favor of the three GSM systems.

RSP - New Zealand Radio Spectrum Authority

Responsible for the management of radio spectrum in New Zealand.

US Dept. of Commerce

The Office of Telecommunications provides a great online source of worldwide wireless telecommunications information.

FCC - US Federal Communications Commission

The organization responsible for the management of telecommunications in the United States. Their responsibilities for public radio communications, such as cellular, include allocation of frequencies, the development of regulations that govern their use and monitoring to ensure that regulations are followed.

Wireless Telecommunications Trade Associations

ATIS – Alliance for Telecommunications Industry Solutions

CTIA - Cellular Telecommunications Industry Association

A trade association of wireless carriers in the United States, Canada and other countries. Originally a cellular organization, it now has members that are Manufacturers, PCS, ESMR and Satellite carriers.

CWTA - Canadian Wireless Telecommunications Association

A trade association of wireless carriers in Canada.

MMTA - Multi-Media Telecommunications Association

An association of companies focused on computer-telephony integration. They announced in November 1996 that they were merging with the TIA.

PCIA - Personal Communications Industry Association
Formerly Telocator, this organization represents Paging, PCS, ESMR, SMR and mobile data service providers as well as communications site managers, equipment manufacturers, and others providing products and services to the wireless industry.
TIA - Telecommunications Industry Association
United States Telephone Association.
A trade association for US local exchange carriers.

Wireless Forums

CDG CDMA Development Group
A trade association dedicated to the promotion of CDMA wireless technology.
MIPS Mobile Internet Phone Services Forum
A new group dedicated to promoting the development of Internet access technologies, services and features from mobile devices.
PACS Providers Forum
PACS (Personal Access Communication System) is a PCS system based on Bellcore's WACS and Japan's PHS, that will provide 64kbps voice and data, but is restricted to low mobility applications.
Universal Wireless Communications Consortium
Promoters of the IS-136 TDMA digital cellular and PCS standards, mostly through conferences and symposiums.
WDF The Wireless Data Forum is an independent, protocol-neutral trade group dedicated to promoting the wireless data industry. WDF's members include wireless operators and equipment providers, application developers and information technology companies working to advance wireless and mobile data products and services.

Glossary

Analog Signal A signal that varies in a continuous manner, such as voice.
ANI Automatic identification of the calling station
ANSI American National Standards Institute.
ATIS Alliance for Telecommunications Industry Solution (formerly ECSA). Responsible for ANSI SS7 standards and US GSM standardization.
BS Base Station
CPAS Cellular Priority Access Service
ESN Electronic Serial Number
GETS Government Emergency Telephone Service
HLR Home Location Register (database of subscriber records)
IFAST International Forum for AMPS Standards Technology
INC Industry Numbering Committee
IS TIA Interim Standard.
JEM Joint Experts Meeting
J-STD Joint ATIS and TIA standard.
LERG Local Exchange Routing Guide

LEA Law Enforcement Agency
MS Mobile Station (i.e. wireless phone)
MSC Mobile Switching Center (aka MTSO)
NAG Numbering Advisory Group
PACA Priority Access Channel Assignment
PN TIA Project Number. Identifies a project during development of a standard.
SP ANSI Standards Proposal. ANSI equivalent of a PN
TLDN Temporary Local Directory Number
TIA Telecommunications Industry Association
TTY Text Telephony
TDD Telecommunications Device for the Deaf
VLR Visited Location Register
WIN Wireless Intelligent Network

APPENDIX L

The following companies have submitted their names to the Alliance for Telecommunications Industry Solutions (ATIS), indicating that they have completed implementation of TTY over digital wireless networks and are compliant with Commission regulations regarding TTY transmission over digital wireless networks, as outlined in the Commission's Fourth Report and Order in CC Docket No. 94-102. Accordingly, neither ATIS or the TTY Forum, or any of their respective members or participants, make any representations or warranties as to the accuracy or completeness of this information.

AT&T Wireless
Caprock Cellular L.P.
Cingular Wireless LLC
Ericsson Inc.
Kyocera Wireless
Midwest Wireless Holdings L.L.C.
Motorola
Nextel Communications, Inc.
Sony Ericsson
Southern LINC

Implementation Status Reports
The following reports were provided to ATIS' TTY Forum.

AT&T Wireless FINAL Status Report for TTY Forum 23
11 October, 2002
Washington, D.C.

NOTE: *AT&T Wireless is in full compliance with the FCC's TTY-Digital Compatibility Regulations. All implementation activities are 100% completed. Therefore, this is AT&T Wireless' final report, and the company should be included on the ATIS list of fully-compliant carriers.*

AT&T Wireless Accomplishments since last report:

Ericsson (GSM) The Ericsson E-CTM server was deployed in all AWS commercially launched GSM markets by 30 June, 2002. Markets that were not in service as of that date have been or will be deployed prior to their commercial launch.

Ericsson (TDMA): Successfully deployed in all AWS markets by 30 June, 2002.

Lucent (TDMA): TTY functionality was enabled in all Lucent TDMA markets in early March, 2002. A revised software patch for TTY that supports a nominal 22 millisecond character bit duration was made GA for network deployment in early Q2, 2002 and has been deployed in all AWS markets.

Mobile Testing: AT&T Wireless performed field testing on several TDMA and GSM TTY-capable handsets.

Nokia (GSM): TTY functionality was enabled in all Nokia GSM markets by 27 August, 2002 (in compliance with terms of limited waiver from the FCC).

Nortel (GSM): A revised patch to allow the routing of TTY calls to a circuit pool based on the status of the mobile's CTM bearer code was made GA in early Q2, 2002

Nortel (TDMA): TTY functionality was enabled in all Nortel TDMA markets by 30 June, 2002.

Handset Availability:

TDMA

Sony/Ericsson: A Sony/Ericsson TTY compatible handset is generally available.
Motorola: A Motorola TTY compatible handset is generally available.

Nokia: A Nokia TDMA handset became generally available during the 2nd quarter of 2002.

GSM

Motorola: Motorola delivered a TTY-capable handset to our lab during Q2, 2001, and is expected to be generally available in Q4, 2002.

Nokia: A Nokia TTY compatible handset is generally available.

Sony/Ericsson: A Sony/Ericsson TTY compatible GSM phone is generally available.

Caprock Cellular L.P.

PO Box 119

Spur, Texas 79370

Progress of TTY-Digital Deployment Solutions

CC Docket No. 94-102

Final Quarterly Report

October 10, 2002

Cap Rock Cellular has completed implementation of TTY- Digital Deployment Solutions and will be included on the TTY Forum's list of carriers that are compliant.

October 1, 2002

To: **TTY Forum**

From: **Susan Palmer and Ken Evans**

TTY Forum #23 Report
Cingular Wireless LLC

Overview

Cingular Wireless LLC (Cingular) continues to provide access to digital wireless service for its customers who use TTYs. All existing switches have been thoroughly tested to ensure TTY compatibility and all new switches must pass the same standard Gallaudet tests before commercial service is activated. TTY compatible handsets are available from three manufacturers in both GSM and TDMA markets. The National Center for Cingular Customers with Disabilities is providing customer support via a direct TTY phone number 1-866-241-6567. This number is listed on the Cingular Wireless website and bills next to the general, voice-based, customer care number. Cingular Wireless has also strongly encouraged its handset vendors to continue to design, develop and manufacture handsets that provide TTY access.

Cingular has been an active participant in TTY Forum related activities including week long ATIS test events starting in September of 2001. The purpose of the testing was to conduct cross infrastructure testing and to quantify the PSAP error issue. As noted in previous reports, testing has revealed that TTY calls to some PSAPs have yielded unacceptable error rates. Unfortunately, PSAP participation in ATIS sponsored testing has been minimal.

Going forward, Cingular will continue to participate in ATIS sponsored interoperability testing to insure cross network compatibility. This will include TTY Forum work with NENA and others to address the difficulties some PSAPs have with TTY signals over digital wireless networks.

Ongoing Issues

Calls to certain PSAPs are yielding unacceptable error rates. ATIS has invited industry participants to numerous weeklong test events. These invitations have been sent to wireless carriers, wireless infrastructure providers, wireless handset manufacturers, TTY terminal manufacturers, PSAPs, and PSAP equipment vendors. These tests have identified and resolved numerous technical and administrative issues. Unfortunately, PSAPs and PSAP equipment vendors have had minimal participation in only one test event. As a result, the industry has not been able to identify the source of the high error rates. ATIS has established a TTY test line to help PSAPs and PSAP equipment vendors determine their ability to communicate with wireless users. To date, only twenty-one individual PSAPs nationwide have participated in one of the

six testing events and only five PSAP equipment manufactures (out of thirty two) have utilized the existing technical tools available through ATIS to test their readiness to receive TTY signals. As a result, our customers may or may not be able to successfully make emergency calls using TTY. PSAP participation in TTY testing is essential to resolution of this problem.

Corr Wireless Communications, L.L.C.

Corr Wireless continues to make test calls with the Ultratec Compact/C Digital TTY device linked with a NOKIA 6360 TDMA Digital phone. There have been more successes than failures and at least one of the failures was due to the PSAP's TTY device being out of order.

Enclosed is information regarding Nortel Networks status to deliver TTY solutions to market in support of CDMA service providers' ability to meet FCC TTY milestone objectives.

- What is the status of TTY/TDD network infrastructure **software/hardware development and testing**?

  Nortel Networks response: Regarding the MTX10/NBSS10.x release, Nortel Networks has completed development, product test and verification. Nortel Networks has completed internal testing using prototype and more recently using commercial mobile handsets with TTY capabilities from a few vendors, which have all shown positive results. Nortel Networks does not anticipate performance issues with any other vendor's handsets once they become available provided they are based on published standards. Nortel Networks has also performed tests with a leading manufacturer of TTY/TDD (Teletypewriter /Terminal for Deaf Device) PSAP (Public Service Answering Point) equipment to ensure interoperability. Results of that specific testing were found to be positive*. This completed TTY/TDD solution is based on standards: IS-127-2 (EVRC) & IS 733-1 (13K Vocoder). Operators will be able to deploy the Nortel Networks TTY solution based on these original standards IS-733-1, IS127-2 to meet the FCC deadline for implementation.
  New revisions of these standards namely IS-127-3 (EVRC TTY) & IS-733-2 (13K TTY) have been published as of September 2001. Nortel Networks plans to support this new addendum to the standards in our next scheduled software release, MTX11/NBSS11, which is scheduled to be generally available (GA) Q4 2002. Product testing for this newer, more robust TTY/TDD software based on the revised CDMA standards is currently underway. The latest test results have shown, under a variety of test conditions, that the TCER (Total Character Error Rate) is less than a percent. These positive results have been repeatable when interoperating with mobile terminals with TTY capabilities from a variety of different vendors who could make their test phones available to Nortel Networks during the testing of this TTY enhancement. Nortel Networks did conclude during interoperability that a few mobile terminals were attributing to a higher than usual TCER due to TTY algorithms internal to those handsets being less than the most current version at the time of testing. These vendors have taken steps to update their mobiles to the latest code; therefore Nortel Networks foresees no issues with interoperability with those mobile terminals in the future.

- For TTY/TDD what are the plans to work with any wireless carrier to perform **end-to-end customer tests**, and when will this occur?

  Nortel Networks response: The verification process for MTX10/NBSS 10.1.2 version of the TTY/TDD functionality with Nortel Networks lead customers was completed as of January 2002. The Nortel Networks TTY/TDD solution showed TCER of less than 1% in most cases and marginally exceeded 1% TCER in only the most strenuous RF and TTY/TDD test conditions*. Nortel Networks used several different TTY mobile terminals during these test activities. Please note the 1% TCER is not part of the FCC mandate.

  A more robust version of the TTY/TDD functionality based on the revised CDMA standards is to be delivered within the MTX11/NBSS11.0 software release, which begins end-to-end lead customer validation testing later this summer.

  Operators are encouraged to request their handset vendors to test their commercial-grade CDMA TTY capable handsets in Nortel Networks Wireless Interoperability Test Lab.

  ***Nortel Networks acknowledges that the positive results of the TTY/TDD software feature is a direct function of the TTY/TDD equipment available to Nortel Networks and their lead customer verification partners at the time of TTY/TDD development, testing, and full network verification. Also note that some of the commercially deployed PSAP**

equipment, consumer TTY/TDD devices, and TTY/TDD capable digital mobile terminals will not comply with the same published standards from which Nortel Networks TTY/TDD solution was developed and tested. This reality will impact wireless operators who strive to deliver the best quality solution. Some operator effort will be required to procure the proper permutation of TTY/TDD equipment to inter-work with Nortel Networks TTY/TDD infrastructure software.

- What is the Network infrastructure software/hardware **planned general availability dates** that support the deployment of this regulatory feature?

  Nortel response: In order that wireless network operators may comply with the FCC's June 30, 2002 requirement for TTY/TDD implementation, Nortel Networks has made TTY/TDD enabling software available as follows:

Software load	CDMA SW general availability
MTX10/ NBSS10.x	Now Available (January 2002)

- What are the **hardware baseline and software baseline** to support CDMA TTY/TDD functionality?

  Nortel Networks response:

Regulatory solution required	CDMA HW/SW baseline
TTY/TDD	NBSS10.x SW (BSS)** TTY capable handsets (3rd party)

****Note: NBSS10.x will operate with MTX09 software, however this configuration will only be supported for 30 days. NBSS software is only fully supported on the previous MTX software version as a step to upgrading to the most current MTX version. I.E. All customers require MTX10 software to not only maintain a supported NBSS10.x load, but to also enable the regulatory feature set contained in MTX10 e.g. CALEA, LNP, E911 phase 2.**

Please also note that the MSC itself must meet certain hardware requirements in order to upgrade to the MTX10 version of software e.g. processor speeds, memory size. These requirements were communicated to customers in the year 2000. Nortel Networks customer account team personnel churn related to Nortel Networks 2001 downsizing activities impacted some smaller customers. In these instances communication did not occur until Q2 2001.

- What is the **schedule for deployment** of the software/hardware in the network?

  Nortel Networks response: The minimum baseline software requirements for this functionality are given above. For questions related to scheduling its deployment into an operator's network, please contact Nortel Networks Product Deployment. The majority of Nortel Networks U.S. CDMA customers (>85%) has already upgraded to MTX10/NBSS10.x software and is therefore TTY/TDD ready. Most of the *remaining* CDMA customers are currently showing plans for MTX10/NBSS10 upgrade after June 30, 2002. Many of these smaller customers that have yet to upgrade have significant hardware prerequisites to procure prior to being able to upgrade their MTX and BSC baseline software version. Many of these same operators have scheduled MTX10/NBSS10.x release for later this year, which is when these mitigating baseline issues delaying switch readiness are closed. There are a relatively small number of rural cellular customers that from whom Nortel Networks has not received confirmation of their upgrade plans.

  MTX11/NBSS11.x software will begin to be deployed into lead customers' networks during the fourth quarter of this year, delivering more robust TTY/TDD software based on the revised CDMA standards.

  Nortel Networks recommends that all customers who have not yet ordered and scheduled upgrade MTX10/NBSS10.x to please contact Nortel Networks to ensure the most expeditious network upgrade.

- What are Nortel Networks **plans to test their own or other vendor handsets** with your switch solution?

  Nortel Networks response: Nortel Networks provides only infrastructure for wireless networks. Nortel Networks does not provide mobile handsets. Nortel Networks recommends that the operator engage its handset vendor(s) in order to respond to the FCC regarding handset availability and interoperability test results with Nortel Networks infrastructure.

  Operators are encouraged to request their handset vendors to test their commercial grade CDMA TTY capable handsets in Nortel Networks Wireless Interoperability Test Lab.

  Please contact Cher Bruce for scheduling TTY testing in the Nortel Networks Wireless Interoperability Test Lab, where testing is based on current published standards (Phone: 972-684-2299; Fax: 972-684-3881; csbruce@nortelnetworks.com)

- Contacts:

Product Marketing	MTX10/NBSS10.x SW	Kurt Raaflaub	(972) 685-2971
Product Management	CDMA TTY/TDD	Maniam P	(972) 685-7203
Regulatory	E911Ph2&TTY/TDD	Charles Spann	(903) 852-6798
Product Deployment	CDMA NBSS SW	Mark Schwarzer	(972) 685-5851

Enclosed is information regarding Nortel Networks plans to deliver a TTY solution in support of TDMA service providers' ability to meet the FCC TTY milestone objective.

- What is the status of TTY/TDD network infrastructure **software/hardware development and testing**?

  Nortel response: Nortel Networks has completed development and testing activities regarding TDMA TTY/TDD functionality. End-to-end system validation within operator networks has also been completed. This TDMA TTY/TDD solution was tested to be compliant to IS-823A (TTY/TDD Extension to TIA/EIA 136-410 Enhanced Full Rate Speech Codec) for the EFRC Codec, and to IS-840. Nortel Networks has tested this feature with alpha/beta handsets from a few major vendors, which have all shown positive results*. We have also received TTY capable mobile handsets containing commercial TTY software from major vendors, which have shown excellent interoperability test results. Nortel Networks has also performed tests with a leading manufacturer of TTY/TDD (Teletypewriter /Terminal for Deaf Device) PSAP (Public Service Answering Point) equipment to ensure interoperability. Results of that specific testing were found to be positive.

  Nortel Networks plans to support new and evolved standards in this year's next software releases. A more robust version of the TTY/TDD functionality is to be delivered within the MTX11 software release. MTX11/NBSS11 is scheduled to be generally available (GA) Q4 2002. This new TTY/TDD version has completed internal testing and has shown greatly improved robustness* when used with certain widely used, but older versions of PSAP equipment that may have issues fully meeting TTY standards.

  Operators will be able to deploy Nortel Networks current TTY solution i.e. MTX10, which is based on the IS-823A and IS-840 standards, to meet the FCC deadline for implementation.

- For TTY/TDD what are the plans to work with any wireless carrier to perform **end-to-end customer tests**, and when will this occur?

  Nortel response: The verification process with Nortel Networks lead customers for the MTX10 software version of the TTY/TDD functionality has completed as of January 2002. The Nortel Networks TTY/TDD solution showed TCER (Total Character Error Rate) of less than 1% in most cases and marginally exceeded 1% TCER in only the most strenuous RF and TTY/TDD test conditions. Nortel Networks used several different TTY mobile terminals during these test activities*. Please note the 1% TCER is not part of the FCC mandate.

  A more robust version of the TTY/TDD functionality is to be delivered within the MTX11 software release, which begins end-to-end lead customer validation testing later this summer.

  Operators are encouraged to request their handset vendors to test their commercial-grade TDMA TTY capable handsets in Nortel Networks Wireless Interoperability Test Lab.

***Nortel Networks acknowledges that the positive results of the TTY/TDD software feature is a direct function of the TTY/TDD equipment available to Nortel Networks and their lead customer verification partners at the time of TTY/TDD development, testing, and full network verification. Also note that some of the commercially deployed PSAP equipment, consumer TTY/TDD devices, and TTY/TDD capable digital mobile terminals will not comply with the same published standards from which Nortel Networks TTY/TDD solution was developed and tested. This reality will impact wireless operators who strive to deliver the best quality solution. Some operator effort will be required to procure the proper permutation of TTY/TDD equipment to inter-work with Nortel Networks TTY/TDD infrastructure software.**

- What is the Network infrastructure software/hardware **planned general availability dates** that support the deployment of this regulatory feature?

  Nortel response: In order that wireless network operators may comply with the FCC's June 30, 2002 requirement for TTY/TDD implementation, Nortel Networks has made TTY/TDD enabling software available as follows:

Software load	TDMA SW general availability
MTX10 TDMA (incl. EDSPM)	Now Available (January 2002)

- What are the **hardware baseline and software baseline** to support TDMA TTY/TDD functionality?

  Nortel response:

Regulatory solution required	TDMA HW/SW baseline
TTY/TDD	EDSPM SW for the ICP; MTX10 SW for the DMS-MTX** TTY capable handsets (3rd party)

****Please note that the MSC itself must meet certain hardware requirements in order to upgrade to the MTX10 version of software e.g. processor speeds, memory size. These requirements were communicated to customers in the year 2000. Nortel Networks customer account team personnel churn related to Nortel Networks 2001 downsizing activities impacted some smaller customers. In these instances communication did not occur until Q2 2001.**

- What is the **schedule for deployment** of the software/hardware in the network?

  Nortel Networks response: The minimum baseline software requirements for this functionality are given above. For questions related to scheduling its deployment into an operator's network, please contact Nortel Networks Product Deployment. Most of Nortel Networks U.S. TDMA customers (>80%) have already upgraded to MTX10 and are therefore TTY/TDD ready. Most of the *remaining* TDMA customers operate smaller networks and are currently showing plans to order and/or schedule a full network MTX10 upgrade after June 30, 2002. Many of these smaller customers that have yet to upgrade have significant hardware prerequisites to procure prior to being able to upgrade their MTX software baseline release. Many of these same operators have scheduled MTX10 for later this year, which is when these mitigating baseline issues delaying switch readiness are closed. Other operators may choose to migrate their networks to improved digital technologies e.g. CDMA or GSM. There is relatively small portion of rural cellular customers that from whom Nortel Networks has not received confirmation of upgrade plans.

  MTX11 software will begin to be deployed into lead TDMA customers' networks during the fourth quarter of this year, delivering even more robust TTY/TDD software.

  Nortel Networks recommends that all customers who have not yet ordered and scheduled upgrade MTX10 to please contact Nortel Networks to ensure the most expeditious MSC upgrade.

- What are Nortel Network's plans to **test their own or other vendor handsets** with your switch solution?

  Nortel Networks response: Nortel Networks provides only infrastructure for wireless networks. Nortel Networks does not provide mobile handsets. Nortel Networks recommends that the operator engage its handset vendor(s) in order to respond to the FCC regarding handset availability and interoperability test results with Nortel Networks infrastructure.

  Operators are encouraged to request their handset vendors to test their commercial grade TDMA TTY capable handsets in Nortel Networks Wireless Interoperability Test Lab.

  Please contact Gerry Chaparro for scheduling TTY testing in the Nortel Networks Wireless Interoperability Test Lab, where testing is based on current published standards (Phone: 972-684-4622; Fax: 972-684-3881; mailto:chaparro@nortelnetworks.com)

- **Contacts:**

Product Marketing	MTX10 SW	Kurt Raaflaub	(972) 685-2971
Product Management	TDMA TTY/TDD	Doug Kinnaird	(403) 769-8461
Regulatory	TTY/TDD	Charles Spann	(903) 852-6798
Product Deployment	MTX/NBSS SW	Mark Schwarzer	(972) 685-5851

MMCD/Panasonic

Matsushita Mobile Communications Development Corporation of U.S.A.

Panasonic TTY/TDD Forum # 23 Status Report

Oct. 8, 2002

Panasonic has been a participant in the TTY forum since November 9, 2000 and is very active producing products that are accessible to the disabilities community. We were happy to announce the general availability of the first digital TTY compliant TDMA handset to the market back in December 2001. We are thankful for the help and cooperation from our industry partners, Alliance for Telecommunications Industry Solutions (ATIS) and the TTY Technical Solutions Incubator (TTSI) with testing and determining technical solutions. We are also thankful to Gallaudet University, National Association for the Def (NAD), and Telecommunications for the Deaf, Inc (TDI) for helping us design a user-friendly TTY capable handset. We are currently designing GSM handsets with TTY capability and incorporating the many lessons we have learned through the forum.

We are also proud to have worked with the many good people from the forum and to contribute to the industry meeting the deadline.

Pieter C. Seidel
Manager Hardware Verification
Panasonic/MMCD